Remarks

The specification has been amended to insert a comma between silicon carbide and silicon nitride in the paragraph bridging pages 8 and 9. This corrects an obvious typographical error and removes any ambiguity in the list of preferred substrate materials.

Claims 1-15 which were drawn to an non-elected invention have been canceled without prejudice.

Claim 16 has been amended to recite that the insulating substrate is a high temperature insulating material capable of withstanding processing at temperatures over 350° C. Support for this amendment may be found in the specification in the paragraph bridging pages 8 and 9. Claim 25 has been amended to correct an obvious typographical error in grammar.

Claims 25-38 were submitted previously, but withdrawn from consideration as being directed to a non-elected invention. Claim 16 as amended recites a method of manufacturing electronic packages having high temperature insulating substrata. Claims 25 and 26 are dependent on claim 16. Claims 27-38 are for electronic packages having ceramic bases. Applicant respectfully submits that there is a unity of invention between claims 16-26 having high temperature insulating substrata and claims 27-38 where the high temperature bases are ceramic. Applicant respectfully requests that all claims be considered.

Claim 16 and 19-22 were rejected as being anticipated by Wood et al., U.S. 3,663,184. Applicant respectfully submits that Wood et al. do not show depositing a metal with a melting point over 350° C, i.e., gold and melting the metal to form metal bumps. Wood et al. (col. 2,

lines 11-12) clearly states, "The bumps of the Wood et al. invention melt in the temperature range of 361° F to 625° F." Obviously, "a gold-tin-gold, or a lead-tin-gold, or a gold-indium-gold solder" as described in Wood et al. (col. 3, lines 5-6) is a low melting gold solder melting below 329° C. In Fig. 2d and Fig. 4 Wood et al. show that the "...layer **20** of gold, perhaps one micron thick..." is not melted on the pads to form metal bumps. The gold layer is merely an adhesive layer for attachment of solder bump **19**.

Applicant respectfully submits that in col. 3, lines 67-70, Wood et al. do not teach copper as a conventional solder constituent. Wood et al. are concerned about the preserving the performance of the semiconductor device after the "flip chip" bonding (col.1, lines 50-53) to a matching support substrate, i.e., the copper conductors of a printed wiring board. During "flip chip" bonding and over the useful life of the semiconductor device, copper from the printed wiring board will migrate into the solder. In mentioning copper in col. 3, lines 67-70, Wood et al. are describing protecting the semiconductor from copper migrating from the printed wiring board through the solder bump. Wood et al. do not disclose depositing a copper solder on a semiconductor device over metallic pads, nor do they disclose a copper solder having a melting point over 350 °C, and below the melting point of the metal forming the metallic pads, and melting the melting the copper solder so that it draws back onto the metallic pads, forming metal bumps on the metallic pads.

Woods et al. are concerned with making "bumped chips", i.e., forming solder bumps on a semiconductor device. In making bumped chips by melting solder on the chip, temperature

control is critical since elevated temperatures will destroy the integrated circuits comprising the chips. Applicant's invention is not a "bumped chip", it is an electronic package for semiconductor devices, as illustrated in Fig. 1, and the first paragraph on page 12 of the specification. Applicant's package is capable of connecting the semiconductor devices to a printed wiring board or higher level assembly. The connection to the higher level assembly is made by the metal bumps, the bumps being metals having melting points over 350° C. Amended claim 16 recites that the support substrate of the package is a high temperature insulating composition capable of withstanding processing above 350° C.

Applicant respectfully submits that there is no teaching or suggestion in Woods et al. of providing an insulating substrate of a high temperature insulating composition, depositing a metal on the substrate, the metal having a melting point over 350 °C, and melting the metal so that it draws back onto metallic pads, forming metal bumps on the metallic pads.

Claims 17-18 were rejected over Wood et al., U.S. 3,663,184 in view of Yamaji et al. (U.S. 6,159,837). Wood et al. has been discussed above. Yamaji et al. make "bumped chips" by screen printing a eutectic solder paste on the semiconductor device, and melting the solder to form a bump. The melting point of eutectic solder is 181° C. The process of Yamaji et al. makes "bumped chips" and not an electronic package having solderable metal bumps as a connecting means as in Applicant's invention. It is respectfully submitted the Wood et al. combined with Yamaji et al. does not teach or suggest Applicant's invention of making an electronic package.

Claims 23-24 were rejected over Wood et al. (U.S. 3,663,184) in view of Kondo et al.

(U.S. 5656,858). Wood et al. has been discussed previously. Kondo et al. describe forming "bumped chips", solder bumps on a semiconductor chip. Kondo et al. lay down a titanium/nickel barrier layer on the semiconductor chip, and coat the barrier layer with an adhesion layer of copper. A solder bump is formed on the copper adhesion layer. On the other hand, Applicant's invention is an electronic package for semiconductor devices, the package having metal bumps for connecting to the next level assembly. The bumps are formed of silver or gold, not solder. When the package is to be joined to the next level assembly by soldering, the silver or gold bumps are coated with a barrier metal to prevent the silver or gold bumps from dissolving in solder as is discussed in the first paragraph of page 8 in the specification. Applicant respectfully submits that Woods et al. and Kondo et al. do not disclose or suggest manufacturing an electronic package by melting silver or gold bumps on its base, the silver or gold bumps being coated with a barrier metal.

The references cited, Wood et al., Yamaji et al. and Kondo et al., all describe depositing various metals such as nickel, gold and copper over the refractory metal barrier layer. However, they do not suggest Applicant's invention of melting these high temperature metal to form metal bumps. Wood et al., Yamaji et al. and Kondo et al. are all limited to low melting solders due to the temperature limitations of the semiconductor devices, which are their bases.

Applicant respectfully submits that subject matter of his invention is not inherent in the prior art references, vide supra. Applicant also submits that his claims, as now amended, given their broadest reasonable interpretation are novel and clearly distinct over the prior art.

Based on the foregoing, Applicant respectfully submits that amended claims 16-24 and unexamined claims 25-38 describe novel methods of manufacturing electronic packages, and respectfully requests an early allowance.

Respectfully submitted

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